this device in a previously reported randomized study.\(^1\) The methods we used to perform MV were nearly the same as those used in that study, but the strategies of tracheal aspiration and instillation were quite different. We performed tracheal aspiration systematically at least every 4 h. This strategy led us to instill \(30 \pm 12\) ml/d in the heated-humidifier (HH) group and \(40 \pm 20\) ml/d in the HME group. In the study by Martin et al.,\(^1\) HH patients received 233 instillations of 5 ml for 599 days of MV (approximately 2.5 ml/d), and HME patients received 300 instillations for 299 days of MV (5 ml/d); ten of the 31 HME patients were not given any instillation.

Since we performed our study, we have used the Pall HME routinely in 560 consecutive patients for a total of 5,880 days of MV, using the same methods as those described in our article.\(^4\) No fatal tube occlusion occurred during this period, and difficulty in suctioning resulted in replacement of the HME by an HH in 14 patients (unpublished data). In contrast to the study period, the use of fiberoptic bronchoscopy as a method of detection of "occult" tube blocking was not systematic in these more recent patients.

The assertion by Dr Sottiaux that tube occlusion is not completely prevented by tracheal instillations is based on the results of Martin et al.,\(^1\) as well as on a case report of tracheal obstruction with a bronchial cast following MV with a Servo SH 150 humidifier.\(^2\) In the latter case, the patient was given only 3 ml of saline solution twice a day for four days, and the incidence of such an accident is not mentioned. No consensus is currently available about the value of periodic instillations into the tracheal tubes of MV patients, a single study\(^5\) having prospectively addressed this point. In that randomized study, Pall HMEs were used for all patients, and tube resistances measured at extubation were significantly lower in patients who underwent tracheal aspirations and instillations than in those who underwent only aspirations. Therefore, tracheal instillations might increase the efficiency of HMEs in preventing tube occlusion by humidifying tracheal secretions, so that we do not agree that the populations studied by Martin et al.\(^1\) and by us\(^4\) are equivalent regarding the management of the tracheal tube.

In conclusion, we do not believe that the Pall HME should be definitively avoided in long-term MV unless tracheal management includes a minimal frequency of systematic tracheal aspirations and instillations. However, we agree with Dr Sottiaux that other newly available HMEs could be more appropriate than the Pall BB 2215 HME for long-term MV\(^4\) and that those HMEs should be clinically assessed.

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**References**

3 Perch SA, Realey AM. Effectiveness of the Servo SH 150 "Artificial Nose" humidifier: a case report. Respir Care 1984; 29:1009-12

**Postoperative Acute Respiratory Distress Syndrome**

A Complication of Amiodarone Associated with 100 Percent Oxygen Ventilation

To the Editor:

Amiodarone is an antiarrhythmic agent that is useful in the treatment of tachyarrhythmias. However, this drug is associated with pulmonary toxicity.\(^4,5\) Possible suspected mechanisms include immunologic disorders, direct toxicity to the lung cells, and the effects of free radicals. A recent report\(^6\) indicates a high incidence of pulmonary complications following 100 percent oxygen ventilation in patients treated with amiodarone. We report here the case of one amiodarone-pretreated patient who experienced lethal acute respiratory distress syndrome (ARDS) following single-lung ventilation with 100 percent oxygen for pulmonary surgery.

A 69-year-old patient underwent surgical resection of the right superior pulmonary lobe for cancer. In the past he had suffered obstructive bronchopneumonopathy and paroxysmal atrial fibrillation, which was treated with amiodarone (1,000 mg/wk for eight years). Preoperative examination showed dyspnea and bilateral rales. A functional pulmonary evaluation disclosed a 63 percent decrease in the forced expiratory volume and a 47 percent decrease in vital capacity. Blood gas analysis showed hypoxemia (PaO\(_2\) = 74 mm Hg). To allow surgery, the left lung was ventilated with pure oxygen via a double-lumen tube for 90 min.

Following surgery, the patient was transferred to the intensive care unit and extubated 5 h later. No blood transfusions were given. The chest radiographic appearance was normal. Blood gas analysis showed hypoxemia without any clinical abnormality (Table 1).

Severe respiratory insufficiency appeared 48 h later, followed by hemodynamic deterioration. The body temperature, ECG findings, and central venous pressure were normal. Despite intensive therapy (artificial ventilation with pure oxygen, positive end-expiratory pressure at 10 cm H\(_2\)O, dobutamine at a dose of 15 mg/kg/min), the patient died 4 h later. A chest radiograph demonstrated unilateral left lung lesions (Fig 1), which appeared as hylane membranes at postmortem anatomicopathologic examination. Blood and sputum culture were negative. Blood gas values are shown in Table 1.

**Figure 1.** Postreintubation chest radiograph shows lesions only in the lung ventilated with 100 percent oxygen.
The clinical evolution in this patient indicates a diagnosis of ARDS with left lung lesions only. In the absence of an infectious process or obvious aspiration, acute liberation of free radicals during and after surgery may be suspected because of the delay in clinical deterioration, with lesions observed only in the lung ventilated with pure oxygen. It is well known that high oxygen concentrations may induce or worsen pulmonary lesions, which may lead to death.2,3

The cumulative toxic effect of high oxygen concentrations and amiodarone explain the rare but lethal ARDS reported here. This case, similar to the case reported by Duke et al.,2 suggests that the oxygen concentration used must be as low as possible in patients requiring respiratory assistance even for a short period of time.

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REFERENCES

5 Tryka AF, Skorin WA, Godleski JJ, Brain JD. Potentiation of bleomycin induced lung injury by exposure to 70% oxygen. Am Rev Respir Dis 1982; 126:1024-79

Diagnosis of Entomophthoromycosis

To the Editor:

I read with interest the article by Majid and Yui,1 which appeared in the August 1991 issue of Chest. I was dismayed by the absence of cultural information and presume that culture was not performed. Clearly, there are major differences in pathogenicity among the various members of the class Zygomyces. Cultural isolation and definitive identification of the causative fungus, in addition to knowledge of host factors, may help to better predict an expected course of infection and response to therapy, be it surgical or medical. Cultural isolation is the gold standard of identification. Other techniques, including serologic or antibody staining, may be nonspecific, as shown with cryptococci, Trichosporon, and other fungi. Most mycologists and fungus-loving clinicians prefer the term zygomycosis when referring to infections caused by these microorganisms. The terms phycymicosis and mucormycosis should be deleted as obsolete. Entomophthoromycosis is the designation given to infections caused by Zygomyces organisms of the order Entomophthorales and to the condition I offer as an alternative etiology in this case.

There are two orders of the class Zygomyces, Mucorales and Entomophthorales. Although organisms of both orders resemble each other morphologically in tissue (aseptate or rarely septate hyphae), there are distinct differences in histologic response and pathogenicity. The genera Rhizopus, Absidia, and Mucor of the Mucorales are opportunistic fungi affecting individuals with neoplasms (leukemia/lymphoma), diabetes mellitus, or acidosis (renal failure), as noted by the authors; however, agents of the Entomophthorales affect normal hosts. The tempo of infection in entomophthoromycosis is generally slow, gradual, or chronic, and infection is usually limited to the subcutaneous tissue or upper respiratory tract.2,3 Almost all infections have been reported from tropical regions such as Africa, India, and Indonesia.4 In one reported case with features similar to those in the case of Majid and Yui, which occurred in a 15-month-old infant from a temperate area, a mediastinal mass was surgically excised and was found to be due to an Entomophthora species.5 Response to surgery and amphotericin B was excellent.

Of particular note in this case and in other cases caused by Entomophthorales, two histologic features have been emphasized in differentiating these organisms from those causing rhinocerebral zygomycosis.6,7 The first is the presence of an eosinophilic tissue response around the organisms, known as the Splendore-Hoeppli phenomenon.8 The second is the absence of vascular invasion. Foreign body-type giant cells are also seen, usually in abundance.

The description of the inflammatory reaction in the case of Majid and Yui is most consistent with entomophthoromycosis, with the presence of organisms within "eosinophilic necrotic material" and the lack of definitive vascular invasion. The relatively gradual onset of disease, the occurrence in Malaysia, and the absence of underlying immune deficit also support this diagnosis.

This case appears to be potentially the second report of mediastinal involvement due to fungi of the order Entomophthorales and the first to respond to surgical excision alone.

Laboratory fungal culture techniques utilizing minced, rather than "ground-up," tissue have improved the recovery of these fungi in culture. Culture of all surgically removed tissues where fungi are in the differential diagnosis should be mandated to better elucidate disease processes caused by these fungi. Until this occurs, argument will exist over the potential capabilities of microorganisms such as Zygomyces for producing distinctive syndromes, responses to therapies, and predictable outcomes.

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REFERENCES

2 Williams AO. Pathology of phycymicosis due to Entomophthora and Basidioles species. Arch Pathol 1969; 87:13-20
3 Dworzack DL, Pollock AS, Hodges GR, Barnes WC, Ajello L, Padhye A. Zygomyces of the maxillary sinus and palate caused by Basidioles heptospora. Arch Intern Med 1975; 130:1274-76